Title:

Vertical Mass, Momentum, Moisture, and Heat fluxes in Hurricanes above 10 km during CAMEX-3 and CAMEX-4

Authors:

Leonhard Pfister (NASA Ames), Paul Bui (NASA Ames), and Robert Herman (Jet Propulsion Laboratory, California Institute of Technology)

Body:

The third and fourth NASA Convection and Moisture Experiments (CAMEX-3 and CAMEX-4) during the Atlantic hurricane seasons of 1998 and 2001, respectively, have yielded comprehensive multi-aircraft datasets using both remote and in-situ instrumentation. Among these are high-frequency in-situ measurements of vertical wind, horizontal wind, temperature, and water vapor from the JPL Laser Hygrometer, made from NASA's DC-8 aircraft in the upper portions of the hurricane (typically above 10 km). These measurements were made at 20 hz (winds and temperature) and 1 hz (water vapor). Fluxes of heat, momentum, and moisture at these levels are important, since modeling studies have shown that ice processes, which are dominant at temperatures below -40C (where the DC-8 flies), are important for hurricane intensification. Also, there are indications from satellite studies that latent heat release at DC-8 levels is significant, perhaps a third of that in the mid-troposphere. Preliminary results show that typical updrafts in the eyewall region are comparable to or higher than previous observations of tropical convection, with several instances of updraft magnitudes of 15 meters per second (the maximum observed was 21 meters per second). They also show significant supersaturations (10-20% or more) in the updrafts, which would enhance the latent heat release at the upper levels of the hurricane. This paper will examine the magnitude and distribution of small and mesoscale vertical fluxes of mass, momentum, moisture, and heat. The goal is to examine the role of these fluxes in the overall budgets of the respective quantities in the upper portions of the hurricane.